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ABSTRACT

To be effective learners, students should know about the state or level of their learning and the success of the strategies they are using, so that when they misunderstand a concept they can do additional reading or consult outside sources. Traditionally, textbook study has been taught through the use of so-called formula techniques, where the formula represents a step-by-step approach to studying the text. In place of this blind training, students should have self-control training or training with cognitive awareness (metacognition). The important elements for any effective studying include (1) having specific purposes or goals for the study session, (2) recognizing the inherent structure of the reading material, (3) purposefully extracting information, and (4) assessing the knowledge gained. Two metacognitive strategies that can be taught easily to students are self-questioning and summarization. In teaching self-questioning, the student must be made aware that before any portion of text is read at all some pertinent questions must be asked to provide context for extracting meaning. In summarizing, students learn to use in-depth processing of the more important ideas in the text and to check what has been gained up to that point. (HOD)

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Effective Studying from Text:
Applying Metacognitive Strategies

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Effective studying from text: Applying metacognitive strategies

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To be effective learners, students should know about the state or level of their learning and the success of the strategies they are using. Students should realize when they misunderstand a concept in a chapter so that additional reading can be done or outside sources consulted. Knowing about and controlling one's learning is termed metacognition (Flavell & Wellman, 1977). In this article, we look at studying and learning how to study from the perspective of metacognition. The process of studying and the strategies that more successful learners have been shown to use will be examined in depth. Also, metacognitive strategies that have evolved in recent research will be briefly reviewed and instructional activities based on the strategies will be suggested. The goal of the instructional activities will be to help less successful learners develop more control over their learning.

Metacognition and Studying

The term metacognition as it has evolved in the literature implies having knowledge (cognition) and having understanding, control over, and appropriate use of that knowledge (metacognition). There are two types of metacognition (Brown, 1982). One type relates to the knowledge that successful learners have about various aspects of the learning situation, including their own capabilities and limitations as learners. The other type refers to those self-regulatory activities that successful learners engage in to produce comprehension when reading, solving a problem or learning in general. These two forms and the activities involved in them are summarized in Table 1.

In general, the research evidence (e.g. Andre & Anderson, 1978-79; Bransford, Stein, Shelton & Owings, 1980; Brown, Campione, Day, 1981; Garner & Reis, 1981; Palinscar, 1981; and Paris & Lipson, 1982) indicates that when students engage in the self-regulatory activities while reading, this enables them to be aware of when they have understood, how well and how much they have understood, and what strategies to use when learning is less than satisfactory. Without this awareness of the level or state of their knowledge, students may only go through the motions of studying (perhaps skimming, taking notes, rereading, etc.) only to discover at the time of examination that the study activity was not satisfactory.

Both effective reading and studying demand that the learner deliberately choose strategies that meet the goals and demands of the task at hand. This implies monitoring of the task demands, the learner's own capacities and limitations, and the interaction between the task demand and the learner's abilities. Understanding and learning from texts is certainly not automatic. A text is only potentially meaningful. Only when learners deliberately use strategies can that potential be realized and effective studying achieved.

Traditionally, studying textbooks has been taught through the use of so-called formula techniques where the formula represents a step-by-step approach to studying the text. The most popular of these techniques

is Robinson's (1946, 1961) SQ3R study technique. However, in terms of helping students become independent learners, these formula techniques have two major shortcomings. First, they do not train the student to learn how to learn. Most of them come under what Brown (1982) calls blind training. According to Brown, under blind training students are induced to use a strategy without concurrent understanding of the significance of that activity. Thus, students are not usually taught to assess the success of using a particular strategy. Secondly, research shows that too many students have difficulty learning the activities formula techniques require (Andre & Anderson, 1978-79; Brown et al., 1981; Brown & Smiley, 1977; Baker, 1979; Olshavsky, 1976-77). Students are not usually given explicit instruction in identifying main ideas, formulating good questions, summarizing passage context, and selecting topic sentences.

In place of this blind training, students should have what Brown (1982) calls self-control training or training with cognitive awareness (metacognition). Students should not only be instructed in the use of strategy, but also explicitly on how to employ, monitor, check, and evaluate that strategy. One major contribution of the research on metacognition and studying is the light it sheds upon the study behavior of successful and less successful learners.

Successful and Less Successful Learners

Successful learners differ from less successful ones in important ways. The research findings (Andre & Anderson, 1978-79; Baker, 1979; Bransford et al., 1980; Brown, 1981a, Brown et al., 1981; Brown & Smiley, 1977; Gambrell & Heathington, 1981; Garner & Reis, 1981; Paris & Myers II, 1981; Olshavsky, 1976-77) dealing with subjects across the development spectrum from children to adults show that successful learners are more knowledgeable of and use strategies during study to control and monitor their learning as it occurs. Poor learners are unaware that they must attempt to make sense out of text. They do not focus on reading and studying as meaning-getting processes. Whereas successful learners can describe their methods and strategies for reading, less successful students seem almost unaware of deliberate strategies that could be employed. Effective learners attend to more important aspects of text and also seem to seek information about the significance or relevance of facts. They take a much more active role in the learning process—relating material to previous experience or knowledge, asking questions, identifying main ideas, comparing and contrasting concepts, etc. Less successful learners on the other hand are much more passive; they fail to evaluate spontaneously whether they understand the nature of the task or whether one set of materials is more difficult to learn than another. Even more important, poor learners are less successful at using strategies effectively when attempting to learn from texts. It should be noted however, that successful learners do not necessarily use all the strategies, nor are they all equally efficient in using them. Also, adults use more of these strategies than children—there is a developmental trend.

In the light of this evidence one can rightfully wonder whether less successful learners can be taught to gain metacognitive control over their study activity. The implications of the evidence here are that learners who are not aware of their own learning, their limitations, or the complexity of the task at hand, can hardly be expected to take preventive actions in order to anticipate and then recover from comprehension

failures. Fortunately, the evidence from research also shows that with the right training, less successful learners can benefit from training in metacognitive activities (Bransford et al., 1980; Brown et al., 1981; Gambrell & Heathington, 1981; Palinscar, 1981). Also Brown (1982, 1981a, 1981b) has demonstrated that metacognition is an acquired skill whose development can be facilitated with the proper instruction. It follows from this that an effective way to help less successful learners overcome their reading and studying problems is to teach them the metacognitive strategies. However, the solution is not that simple. The major problem is that most of the self-regulatory activities in the table have not yet been translated into explicit pedagogic procedures to be used by both teachers and learners. Our task in the next two sections is first to describe the elements necessary for effective studying and then translate two of the major metacognitive strategies into explicit studying and reading strategies.

Elements of Effective Studying

The important elements that learners should incorporate in their study, or information the teacher ought to convey to students to help them learn how to learn include the following:

1. Having specific purposes or goals for the study session

Setting the goals or purposes of study has the effect of directing attention to: (a) the topic under discussion; (b) the knowledge or skill learners are supposed to have acquired at the end of the study period; (c) amount of effort required; and (d) the strategies that may be most effective in the extraction and retention of the information. Learners must understand both the explicit and implicit demands of the task before them. For example, if the learner need, to study a chapter on "The Nerve Impulse", the individual may have to state the following: "This chapter deals with the nerve impulse. By the time I finish studying it I have to know what it is, what it does, the things that influence it, and how all this new information relates to what we have discussed in class so far. Since I don't know anything about the nerve impulse, what will I need to do in order to find out about it? Or given what I know now, what else do I need to do to understand the nerve impulse?"

2. Recognizing the inherent structure of the reading material

Most learners, including some successful ones, fail to realize that the author of a text is conveying information in a meaningful, organized way. A learner needs to gain insight into how that author goes about conveying information about the topic. Learners who can determine the structure of reading material are better able to plan their studying activity. Such learners may ask themselves: "Is the passage broken into sections/subsections? If so, how does that explanation progress? Do headings give clues to the ideas in the material? Does this information (headings) help tie the ideas together? Can one or two sentences or questions convey the essence of the chapter?" Determining the structure of reading material is easier said than done. Learners may not be able to achieve understanding of text organization until after an initial reading of the material or until after class discussion with the teacher and classmates. On the other hand, learners who can eventually form a viable "mental outline" of a section of text have given themselves evidence of metacognition for that information and a deep level of understanding.

3. Purposefully extracting information

The effective learner strives to make sense out of the information through self-questioning, identifying important points of the text by deleting redundant and irrelevant information, focusing attention and effort on the major ideas. In short, the effective learner makes use of the activities outlined in Table 1. Here, effective learners may ask questions like: "How do I plan to understand this material? What strategies will I use? How am I going to approach this material? What activities can I engage in to understand what I am reading? Will I need outside help from the teacher? What is the most efficient way to understand this? Do I know enough about the material that I can skip some parts? What is the best way of determining the main ideas?" Purposeful extraction of information is the heart of effective studying because the effective learner consciously tries to make use of the self-regulatory activities. In the next section, we show how some of these skills can be taught to ineffective learners.

4. Assessing the Knowledge gained

While metacognition implies that the learner engage in ongoing evaluation of the level or state of his or her understanding, the final element in effective studying requires the learner to conduct some kind of self-assessment on the information covered in the reading material. Unlike reciting where the learner merely rehearses the information, metacognitive learner's self-assessment may proceed in this manner: "What do I know about the topic after my study? What are the major ideas, and how are they related to each other? Can I summarize the reading material in 50 words, in 25 words? Can I tell a friend what I just acquired from my studying?" For each question, the learner must provide a self-satisfactory answer to ensure that the material is known.

Teaching Metacognitive Strategies

In this section, we deal with two metacognitive strategies that can be easily taught to students. Unlike the formula techniques, there are no rigid rules as to how these strategies should be taught. But, we can give certain guidelines.

Of all the activities listed in Table 1, the two most significant and encompassing are self-questioning and summarization. Most of the other self-regulatory activities like identifying main ideas, looking for relationships between ideas, determining the structure and organization of material, determining sequence of events, locating and skimming redundant and unimportant information, all require the learner to use self-questioning and summarization rules. So, once the learner has mastered these two major strategies, all the others can easily be acquired too.

Self-questioning

Self-questioning by the learner has been shown to be one of the most powerful metacognitive activities (e.g. Brown, 1982; Brown et al., 1981; Palinscar, 1981). Here, interest is in teaching students how to ask themselves questions about the material. Both the process and products of self-questioning are important for this strategy: (1) knowing the material and developing questions that require knowledge of the major ideas in order to answer them sufficiently; (2) knowing that one has created such good questions that direct attention to main ideas as opposed to trivial or superficial questions that direct attention to redundant or unimportant aspects of text; and (3) using these questions throughout study of the material to assess one's learning progress.

The learner should be made aware that the author is conveying information. To know what this information is will involve constant monitoring of the reading process through asking the right questions. These questions should be asked before, during and after reading each section of text. Questions asked before or in the middle of a text can be reformulated when more information is acquired. For example, the chapter on "The Nerve Impulse" may have a section entitled "The action potential". The natural question to ask before reading that section may be "What is the action potential?" However, this may not be the best question to ask about the information in that section. Half-way through or at the end of the section, the learner may realize that the best question to ask is "How does the neuron transmit information from one part of the body to the other?" So, there is nothing permanent about the question asked. They can and should undergo constant reformulation as the learners extract more information, in contrast to traditional efforts when teaching the formula techniques. Critical to teaching this strategy is that students have the opportunity to practice formulating, evaluating, and reformulating questions as they read various content area paragraphs.

Teaching Self-questioning

The learner must also be made aware that before any portion of text is read at all, some pertinent questions must be asked that provide context for extracting meaning. Some of the questions to be asked before reading could be:

- What is the nature of information being conveyed by the author?
- How does the author convey this information?
- What concepts are introduced?
- How are the various concepts related?
- How is the material organized?
- Can I follow the organization?
- Do I need to know something else in order to understand this information?

The learner must be made aware of the fact that within-section questions are different from between-section questions. The within-section questions are essentially the same as the general questions that are to be asked before reading. However, the questions are now more specific with regard to the concepts in the text. For example, whereas before one could have asked, "How are the various concepts related?", now one has to ask, "How is the nerve impulse related to the action potential?" As one moves from one sub-section of text to the next, one could ask questions like:

- Did I understand the main ideas in the previous section?
- How are the ideas in this section related to the previous one?
- Did the author introduce a new concept in this section?
- Are the ideas in this section elaborations of the previous one?

Can I make a connection between all concepts presented so far?

The learner must be made aware that post-reading questions are essential for evaluating overall understanding of text. Examples of questions that could be asked after reading are:

Do I understand everything I have read?

Can I give a brief summary or a gist of what I have read?

Can I outline the chapter?

Can I list the main points of the text?

How much of this information is new and how much did I already know?

Does the information here have any personal significance for me? etc.

The net effect is that questions are asked before, during, and after reading. This provides a constant monitoring of the reading process.

Since teachers are the local "consultants" in a classroom for question asking skill, teaching students self-questioning can be viewed as more or less showing the students what the teacher does when developing a test to create good, in-depth questions of the text. Once students know that this is what the teacher does to create their tests, and that this activity will be helpful to their study, the teacher can begin modeling questions for the students, creating questions for them about material read most recently. The teacher could say, "Looking at this material, I would ask these questions if I were designing a test." The model questions should be given a critical look by students as to their relevance to the material and to the depth of understanding required to answer them. Some criteria are: Why is this question better than that one? How much understanding does this question demand in order to answer it? By answering this question, will we move closer towards reaching our goals for study?

Next, the students are given the chance to make up questions about new text material, and these questions are compared to the model questions examined previously. Less able students could be paired with more able students to help them learn the process involved. Once questions are created, students can then evaluate each others' in terms of the above criteria and the particular passage under discussion. They should be given the opportunity to explain and defend why some questions are effective while others are not.

After much guided practice, students can then try to self-question during study on their own. Then while in class after study, students can again share their questions, discuss the merits of these questions, and describe the extent to which the process of self-questioning was helpful to their study activity.

Summarizing Text

Producing summaries of text information has a number of benefits for student learning in terms of gaining metacognition. First, summarization is a good way to estimate one's preparedness to be tested while studying is still occurring. By attempting to summarize major points, the learner is checking to see what has been gained up to that point. Second, summarization forces learners to use in-depth processing of the more important ideas in text.

Putting ideas into summary form is not a haphazard process, but one which Brown and her colleagues (Brown et al., 1981) have discovered requires the use of different rules. These general rules and strategies include: (1) deletion of irrelevant or trivial information; (2) deletion of redundant information; (3) selection of topic sentences; (4) substitution of a super-ordinate term or event for a list of terms or actions; (5) invention of topic sentences when none is provided by the author.

The evidence available (Brown et al., 1981) seems to indicate that there is a clear developmental trend in the awareness and use of these rules. Middle grade students are more able to learn the first two rules, while high school and college students can be taught to use all of the rules, the invention rule being the most difficult to learn. Brown et al. (1981) suggest that teaching students to use the rules during reading requires explicit instruction. Direct explanation and practice helps students to use the rules, but the researchers propose that students need to learn how to check or monitor their use of the rules to attain the most efficiency in learning. This monitoring involves students evaluating their summaries to assess the degree to which they really followed the rules; for example by asking themselves, "Did I choose a topic sentence?" and "Did I delete all trivia?" If students find that they are unable to select a topic sentence, for example, this should be a signal that comprehension is not as good as it should be and further study is needed.

Teaching Summarization

Again, only general guidelines will be given. The teacher can devise more creative ways based on the guidelines given (cf. Paris & Lipson, 1982).

1. Make students aware of the summarization rules

Most of the time, students do not use a strategy because they do not know it exists or they lack appropriate skills for using it effectively. This first step involves making students aware of the available strategies for summarizing and then explaining the relevance of these rules for effective study. Too often students are told to use a strategy based solely upon a teacher's authority and without rationale that it will actually benefit their learning or make learning easier. However, once the values for using strategies are clearly explained and demonstrated to them, students will begin and continue to use these strategies.

2. Introduce and Model the use of each rule

Because rules 4 and 5 are too difficult for many middle grade students, instruction in these should be avoided for these students. For older students, explain how each rule works, when each is applicable, and how the five rules might work together, depending upon the abilities of the students present. For each rule, direct students' attention to a piece of text and model how the rule can be used. For example, a short passage of text in history could be used to illustrate rule 1 by the teacher saying aloud what the important ideas are therein, pointing out where these are located in text, and showing students the less important information that can be left out of the summary without destroying meaning. Once students catch on to the process, as a group they can continue summarizing additional passages from that text, much as students would participate in a language experience story. Later, further condensation of these same passages could occur using the remaining summarization rules as they apply. Teacher and students can discuss how effective these rules are, their individual ease in use, and how producing summaries aids their understanding and retention of the information in the passages.

3. Give guided practice through group summary writing

Small groups of students can study text to produce a summary together, each student contributing his/her skills in locating the important ideas, in using the rules, and in composing the written summary. Later, all groups can come together to compare their summaries for the same passages and to defend what they have included or excluded in their summaries to others. This step has value in many ways. First, it helps students to get a more direct grasp of the use of summarization rules by working with peers in their application. Second, small group interaction allows students to work together upon and discuss the more or less important information in the passages at hand. This certainly is beneficial for better understanding the information for class discussion of the topic of concern. Finally, sharing summaries of different groups permits students to share the decisions they each made in the composing process. Because groups will differ in their paraphrasing of the information, groups will also be sharing their interpretations of the passages they read.

4. Direct students to summarize parts individually on their own

These summaries can then be discussed as a group much as before. The teacher can review these individual summaries as a form of assessment of student's skill in the use of the rules and then the teacher and other students can give help where needed. It is important here to have students assess and discuss the value of producing summaries for their learning to maintain their awareness of the benefits of this study activity. (For an excellent variation of this approach, see Smith-Burke, 1982).

Summary

The point of view proposed here was that study skills and reading instruction based on the concept of metacognition are more beneficial than traditional study skills instruction. The major task remaining however is to translate the self-regulatory activities into explicit instructional formats. In this article, two major metacognitive strategies were discussed in terms of their application to classroom study skills and reading instruction.

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Table 1
Two Forms of Metacognition

I. Activities that Show Awareness of One's Knowledge

- A. Recognizing that one has failed to understand.
- B. Knowing the state or level of one's understanding; that is, knowing how well and how much you understand.
- C. Knowing what you need to learn in order to know or understand.
- D. Knowing the value or utility of taking corrective action to remedy failures.
- E. Knowing that different learning tasks impose different cognitive demands.

1. different goals for reading demand different amounts of effort;
2. different types of reading material demand different levels of concentration and effort.

II. Self-Regulatory Activities that Produce Understanding

- A. Analyzing the task to identify effective strategies.
- B. Monitoring the effectiveness of strategies used.
- C. Testing, revising, and evaluating strategies used.
- D. Planning the action one will take throughout the unit of reading material.
- E. Identifying the important ideas.
- F. Skimming for information.
- G. Rereading to clarify ideas.
- H. Summarizing and paraphrasing.
- I. Establishing and looking for relationships.
- J. Determining the structure or organization of information.
- K. Pausing to test one's understanding.
- L. Relating information to one's previous knowledge.
- M. Recognizing the sequence of events.
- N. Self-questioning and self-testing.
- O. Predicting the questions that will be posed after study.